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OBTAINING CGSB APPROVAL FOR A NEW STANDARD PAINT TEST METHOD: AN INDUSTRY PERSPECTIVE

Alberta
MUNICIPAL AFFAIRS
Innovative Housing Grants Program

[redacted]

OBTAINING CGSB APPROVAL FOR A NEW STANDARD PAINT TEST METHOD: AN INDUSTRY PERSPECTIVE

October, 1988

Prepared by:

Canadian Home Builders' Association

The views and conclusions expressed and the recommendations made in this report are entirely those of the authors and should not be construed as expressing the opinions of Alberta Municipal Affairs.

With funding provided by
Alberta Municipal Affairs

ISBN: 0-88654-233-2

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FOREWORD

The project documented in this report received funding under the Innovative Housing Grants Program of Alberta Municipal Affairs. The Innovative Housing Grants Program is intended to encourage and assist housing research and development which will reduce housing costs, improve the quality and performance of dwelling units and subdivisions, or increase the long term viability and competitiveness of Alberta's housing industry.

The Program offers assistance to builders, developers, consulting firms, professionals, industry groups, building products manufacturers, municipal governments, educational institutions, non-profit groups and individuals. At this time, priority areas for investigation include building design, construction technology, energy conservation, site and subdivision design, site servicing technology, residential building product development or improvement and information technology.

As the type of project and level of resources vary from applicant to applicant, the resulting documents are also varied. Comments and suggestions on this report are welcome. Please send comments or requests for further information to:

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ACKNOWLEDGEMENTS

The Canadian Home Builders' Association commends the Alberta government for their proactive support for technology development in the residential construction industry. This support is delivered through the Innovative Housing Grants Program administered by the professional staff of Alberta Municipal Affairs Housing Research and Development section. This initiative and commitment to housing technology development is unique in Canada, outside of the federal government. The Canadian Home Builders' Association acknowledges this leadership and the productive contributions to housing quality and affordability which are made possible by it, and recommends that it be emulated in other provinces.

The authors thank Mr. Harry Ashton, formerly of the Division of Building Research, National Research Council and Chairman of the CGSB Paint Test Method Subcommittee whose technical review helped to ensure the successful designation of this test method as a National Standard of Canada. As well, the considerable guidance and assistance of Mr. Terry Toth, P.Eng. of Alberta Municipal Affairs Housing Research and Development section, is acknowledged.

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EXECUTIVE SUMMARY

1.0 OBJECTIVES

This project dealt with two major objectives related to the standards process in Canada. The primary objective was to gain Canadian General Standards Board (CGSB) approval for a standard paint test method which, when implemented, would allow certain interior paints to be classified and recognized as vapour diffusion retarders as defined by the National Building Code of Canada. The secondary objective was to document through actual experience the process by which a method or procedure gains recognition as a Canadian Standard.

2.0 BACKGROUND

The need for this project arose from the continuing development of the Airtight Drywall Approach (ADA) to house construction. ADA utilizes drywall and framing members to provide a sufficient air barrier. Work on ADA showed that, with this approach, the polyethylene vapour diffusion retarder is not required, providing an acceptable interior paint coating is used in its place. However, implementation of ADA was impeded, since Building Code jurisdictional authorities had no means by which to gauge the ability of paints to meet code requirements for a Type 2 vapour diffusion retarder, a role traditionally played by polyethylene sheet.

In 1986, Alberta Municipal Affairs (AMA), commissioned the Alberta Research Council (ARC) to develop a method by which paints applied to drywall can be tested for permeability. Paints meeting or exceeding the permeability requirements of a Type 2 vapour diffusion retarder could then be qualified as the vapour diffusion

retarding element in the ADA technique. Development of the test method was completed in late 1987. Through the subsequent CGSB approval process, the test method was named "Method for Permeance of Coated Wallboard".

3.0 APPROACH

In order for the test method to be accepted by jurisdictional authorities, it must be recognized as a CGSB approved standard. Because of the particular relevance of this proposed standard to the residential construction industry, the Canadian Home Builders' Association (CHBA) was selected to act as the applicant for approval. As the applicant, CHBA was also required to work directly with the various agencies of CGSB throughout the approval process. In addition to financial support, the Innovative Housing Grants Program of Alberta Municipal Affairs provided, through its professional staff, guidance and coordination during the initial stages of the work.

4.0 RESULTS

There are five major steps in the CGSB standards approval process:

1. Preliminary Review and Investigation

   A proposed standard is reviewed by CGSB officers for the purpose of determining its merit and qualification. Merit is largely determined by two criteria:
   a) Is the standard needed?
   b) Will industry use the new standard?

2. First Level Approval

   The proposed standard is assigned to a Standards Committee, whose responsibility it is to develop the standard from a technical viewpoint, and, through a consensus voting procedure, to ratify it as a qualified CGSB document.

3. Second Level Approval

The document is forwarded to the Standing Committee on Standards, which has the responsibility of ensuring that the policies and procedures of the CGSB were properly administered during the first level review and approval stage.

4. Final Approval

A final review of the document is carried out by key CGSB officers to again confirm that the policies and procedures of the CGSB were properly administered during first and second levels of approval, and to confirm the significance of the standards contribution to the national interest.

5. Dissemination

The approved standard is translated, printed in quantity and distributed for sale to the general public.

Depending upon the nature and complexity of the proposed standard, the time required for approval can range from several months to several years.

Including a 19 month time period for development of the test method, the time required for approval of the method for Permeance of Coated Wallboard was approximately 31 months. Publication of the resultant National Standards is expected in April of 1989.

Once the Standard is published and distributed, paint manufacturers will be able to have their products tested for suitability as vapour diffusion retarders on drywall. Building Code jurisdictional

authorities will have a means for acceptance of paint as a vapour diffusion retarder when used with ADA, and a major obstacle to the widespread implementation of ADA will have been eliminated.

1.0 INTRODUCTION

1.1 Background

In recent years, the Airtight Drywall Approach (ADA) to house construction has emerged as a viable, energy efficient building technique. ADA utilizes interior gypsum board, framing members and strategically placed gasketing and caulking in combination to achieve building envelope airtightness.

When properly coated with appropriate interior paints, ADA techniques eliminate the requirement for the polyethylene sheet vapour diffusion retarder. The operative word in this last sentence is "appropriate". In order to replace polyethylene sheet as the vapour diffusion retarder, the paint coating must be proven to be equivalent to the polyethylene sheet. Canada's National Building Code (NBC) establishes the performance requirements for the vapour diffusion retarder by specifying in Article 9.26.3.4:

> "Vapour barriers shall conform to CAN2-51.33, "Vapour Barrier: Sheet, for use in Building Construction." Type 1 vapour barriers shall be used where a high resistance to vapour movement is required, such as in wall constructions that incorporate exterior cladding or sheathing having a low water vapour permeance. Type 2 vapour barriers may be used in all other locations."

Wood frame housing normally requires a Type 2 vapour barrier which, according to the referenced standard, can have a water vapour permeance of no more than $60 ng/Pa.s.m^2$. To date, the material of choice for compliance with this requirement has been polyethylene sheet.

The NBC also makes reference to the role of the "vapour barrier" as an air barrier. Appendix A, subsection 9.26.5 states in part:

> "Although this subsection refers only to vapour barriers, such an element in a wall or ceiling assembly of conventional wood frame construction also acts as a barrier against movement of interior air into insulated wall or roof cavities."

The Airtight Drywall Approach has been accepted by regulatory authorities on a per-job basis. Regulatory authorities recognize the airtightness function of ADA, but have been unable to recognize the vapour diffusion retarding function when coated with appropriate paints, because of the lack of a quantitative means to determine equivalency to the Type 2 vapour barrier requirements stipulated in the NBC. Several methods exist for determining the permeance of paints, but none existed with drywall as the specific substrate.

In recognition of this circumstance, Alberta Municipal Affairs (AMA) commissioned the Alberta Research Council (ARC) in 1986 to develop a method by which the permeance of paints on a drywall substrate could be quantitatively defined. Development of the test method (see Appendix 1) was completed in September of 1987. Using the method, ARC demonstrated that, when compared to the NBC requirements for a Type 2 vapour diffusion retarder, alkyd sealers and enamels generally met or exceeded those requirements, while latex primers and paints did not.

The existence of this test method did not in itself remove the obstacle of allowing qualifying paint coatings to replace polyethylene sheet as the vapour diffusion retarding element when used with the Airtight Drywall Approach. To be accepted, used and referenced by Building Code authorities, the method must first be approved and recognized as a standard test method. In Canada, the agency responsible for granting such approval is the Canadian General Standards Board (CGSB).

1.2 Objectives

This project addressed two major objectives:

1. to apply for and obtain Canadian General Standards Board approval for the paint permeance test method as developed by the Alberta Research Council, and
2. to document, through actual experience, the process of obtaining a CGSB standard for future reference by the housing industry.

Attainment of the first and primary objective completes one more step in the advancement of the Airtight Drywall Approach. As noted in Section 1.0, ADA has been proven to be a viable means of energy efficient house construction, but implementation in its intended form has been hampered by the continuing requirement for a polyethylene water vapour diffusion retarder. A CGSB-approved, standard method for determining the water vapour permeance of paints on a drywall substrate, will provide building code jurisdictional authorities with a quantitative means for determining the equivalency of paint to polyethylene sheet when used in conjunction with the Airtight Drywall Approach.

Because of the emerging importance of standards in general, the work of the second objective will provide an informative guideline to the procedures involved in standards approval process. This in turn will foster a better understanding of the Canadian standards approval process from an industry perspective.

Because of the particular relevance of this proposed standard to the Canadian housing industry, the Canadian Home Builders' Association (CHBA) was selected as the applicant for CGSB approval. CHBA is a voluntary association representing home builders across Canada. Both CGSB and CHBA are headquartered in Ottawa, and the resulting geographic convenience is an important factor when the overall cost of the approvals process is considered.

1.3 Format

The ensuing sections of this report describe in detail the activities of the project. Section 2 discusses the Canadian General Standards Board, its method of operation, and the formal procedure normally followed in the approval of a proposed standard. Section 3 describes the activities of the CHBA in actually obtaining CGSB approval for the paint permeance test method. Section 4 discusses the major conclusions drawn from this project together with their potential impact on the housing industry.

2.0 THE CANADIAN GENERAL STANDARDS BOARD

2.1 Background

In 1934, the National Research Council created the Canadian Government Purchasing Standards Committee to identify common federal department needs and to develop specifications for common use in the purchasing of goods and services. Fourteen years later, the name of the committee was changed to the Canadian Government Specifications Board. As time progressed, the scope of the Canadian Government Specifications Board expanded to include the needs of industry in general as well as those of the federal government. In 1973, the Standards Council of Canada accredited the Board as a member of the National Standards System. In 1980, to better reflect the broader national scope of the Board, the name was again changed to the Canadian General Standards Board.

The current role of CGSB is to develop and maintain standards and to manage qualification and certification listing programs for the benefit of both the public and private sectors. Today, CGSB is responsible for over 1500 standards and specifications in more than 80 subject areas.

2.2 Principles of Operation

The CGSB utilizes two major principles of operation - consensus and cost recovery.

2.2.1 Consensus

The standards approval process is generally administered by various committees (see Section 2.3). Approvals are based upon consensus voting by members of the committees. Consensus requires that the opinions of all interested parties be considered and that negative votes which are reasonably persuasive be resolved. The consensus procedure, therefore, ensures that the will of a substantial majority of those entitled to vote is reflected. To achieve a positive consensus vote, at least 60% of those entitled to vote must have cast their ballot, and of that number at least 50% must have voted in favour.

Since members of a particular committee may be geographically located across different regions of the country, the voting process is carried out by means of a "letter ballot". Details of a proposed standard are mailed to each voting member, and each member returns his or her vote by mail to CGSB. Negative votes must be accompanied both by reasons for the vote and proposed solutions which, if endorsed, would change the vote to an affirmative. Voting members may abstain on a particular ballot. Abstention generally occurs when it is felt that a member lacks the expertise necessary to properly judge a proposed standard. Though no absolute limits are placed on the number of abstaining votes cast, a committee will generally withhold approval pending further discussion if the number of abstentions is more than three.

2.2.2 Cost Recovery

CGSB committees are generally composed of members whose expertise or interest is relevant to a particular category or subject area. For the most part, committee members are not paid for their involvement, unless they are directly employed by CGSB. The costs incurred by CGSB in the approval of a particular standard are generally administrative in nature. If, through investigation, the CGSB determines that a proposed standard is worthy of pursuit, they will provide the applicant with an estimate of the costs that will be incurred through the approval process. The applicant must be prepared to pay those costs, or to identify a suitable sponsor who can pay the costs. Standards approval activities cannot generally proceed without a cost recovery resolution.

2.3 CGSB Functional Bodies

The standards approval process is administered through a series of technical and administrative committees. A standards committee will normally have from 15 to 30 members. Committee members are selected to represent an even balance of interests, from both the private and the public sectors. Generally, three major groups are involved in the approval of a standard.

2.3.1 Standards Committee

The Standards Committee has the responsibility for developing and granting technical approval to a proposed standard.

Generally, before being assigned to a Standards Committee, a proposed standard has been subjected to a preliminary review and investigation by CGSB officers. Having determined the worthiness of the proposed standard, and having resolved the matter of cost recovery with the applicant, these officers will then proceed with the assignment to the appropriate Standards Committee. Depending upon the preparedness of the applicant, a proposal may be in the form of a complete document for review by the committee or simply a definition of need for development by the committee. Following initial discussion, the chairman of the committee will assign a working group, with the responsibility for preparing the proposed standard in draft form, and for preparing the letter ballot to be circulated to the members of the committee. Committee members consider technical merit, format, content, reliability, practicability and ease of use when casting their ballots. When votes are counted and a positive consensus is considered to have been reached, the proposed standard is considered to have achieved First Level Approval. This is often the most crucial level of approval since the technical aspects of the proposal have been dealt with in detail.

2.3.2 Standing Committee on Standards

The Standing Committee on Standards (SCS) is a unit of the Minister's (Supply and Services) Advisory Council (MAC). Its role is administrative and its mission is to ensure, again through letter ballot and concensus procedures, that the policies and procedures of the CGSB have been properly applied and enforced by the Standards Committee. A proposed standard will have received Second Level Approval once an affirmative consensus has been reached by the Standing Committee on Standards.

2.3.3 Standards Council of Canada

The Standards Council of Canada (SCC) is not a committee; rather it is a statutory corporation having the objective of "fostering and promoting voluntary standardization in Canada". After Second Level approval, a standard is subjected to final administrative review by key CGSB officers. This review considers the scope of representation of the Standards Committee and the SCS, the procedural process at Second Level review, the manner in which negative votes were handled, and the significance of the standard's contribution to the national interest. If this review confirms uniformity and completion in all respects, the SCC is advised accordingly, and will indicate its approval. This represents the final level of approval to which a standard is subjected.

2.4 Types of Standards

There are many types and levels of standards. Three of the most significant types will be described in this section. From the highest level of approval to the lowest, they are:

2.4.1 National Standard of Canada

All proposed standards are candidates for National Standard status. A National Standard is simply one which has a scope of significant national interest. Approval by SCC is required.

2.4.2 CGSB Standard

This is a standard which affects only certain industry sectors, that is, its scope does not impact upon the national interest in general. Approval at the Second Level is required for a CGSB standard.

2.4.3 Provisional Standard

Provisional Standards are issued when (and only when) there is a clear and urgent need for a published standard, and there is no time to implement the full procedural process. First Level approval is required for a Provisional Standard.

2.5 Going Public

Once a standard has attained its appropriate level of approval, there is still a significant amount of work to be done before it becomes available, as a document, to the general public. It must be translated, and must then take its place in line for typesetting and quantity production. Finally, it is distributed for sale to the general public. The cost to buy a published standard is normally in the range of $30.

2.6 Summary of the Approval Process

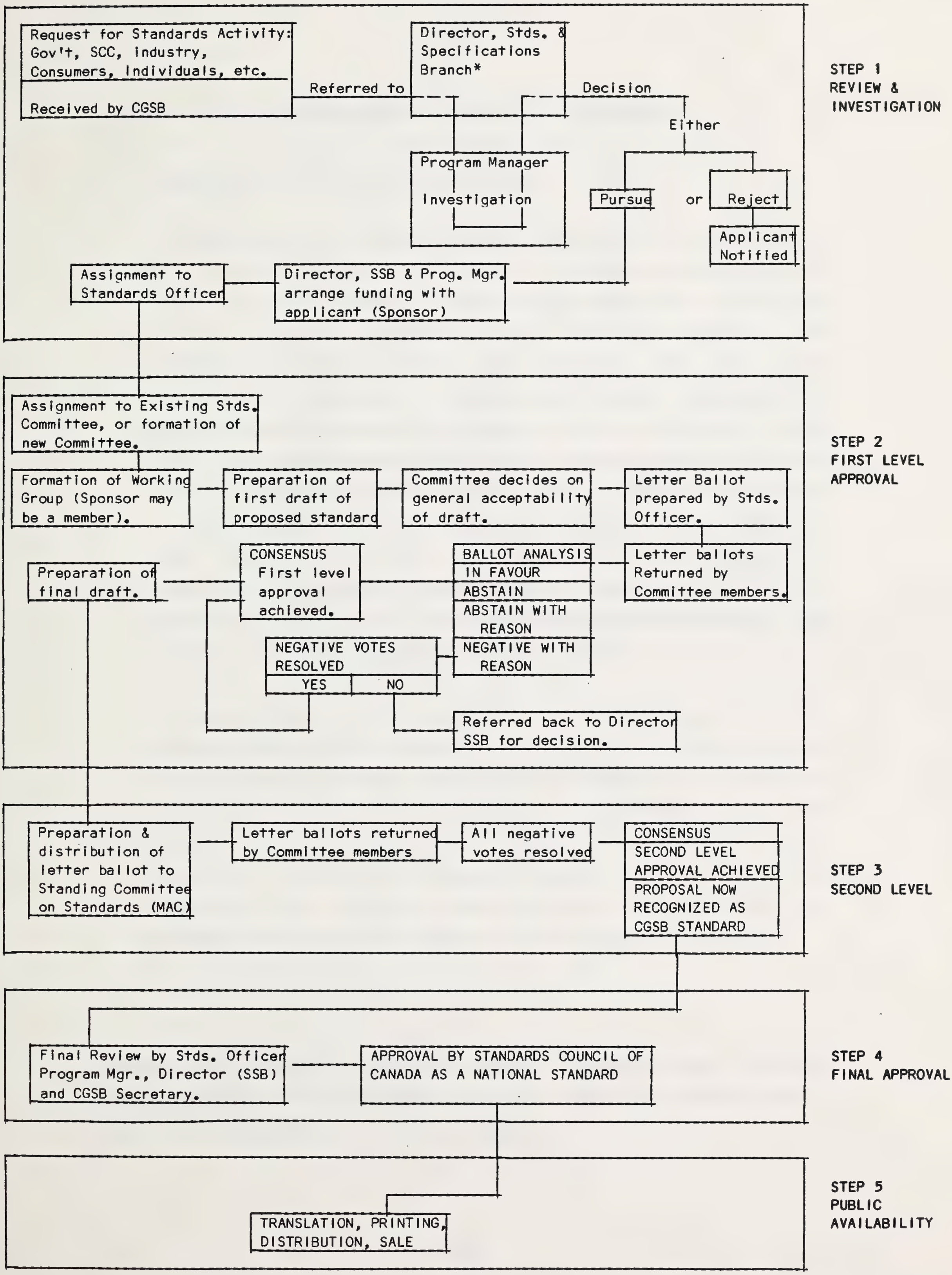
The major steps in the approval of a proposed standard can be summarized as:

1. Preliminary review and investigation - 1 to 6 months
2. First level review and approval - 6 to 30 months
3. Second level review and approval - 2 to 6 months
4. Final review and approval - 1 to 3 months
5. Production and distribution - 3 to 12 months

The time frames attached to these steps are, at the very best, rough estimates. Timing is dependent upon the scheduling of committee meetings, the possible priority of other work items, the preparedness of the applicant, and the ease of passage through the various approval phases.

Figure 1 shows the major steps broken down into their various tasks.

FIGURE 1: THE CGSB APPROVAL PROCESS


Request for Standards Activity: Gov't, SCC, industry, Consumers, Individuals, etc.
Received by CGSB
Referred to
Director, Stds. & Specifications Branch*
Decision
Either
Program Manager
Investigation
Pursue
or
Reject
Applicant Notified
Assignment to Standards Officer
Director, SSB & Prog. Mgr. arrange funding with applicant (Sponsor)
STEP 1 REVIEW & INVESTIGATION
Assignment to Existing Stds. Committee, or formation of new Committee.
Formation of Working Group (Sponsor may be a member).
Preparation of first draft of proposed standard
Committee decides on general acceptability of draft.
Letter Ballot prepared by Stds. Officer.
Preparation of final draft.
CONSENSUS First level approval achieved.
BALLOT ANALYSIS
IN FAVOUR
ABSTAIN
ABSTAIN WITH REASON
NEGATIVE WITH REASON
Letter ballots Returned by Committee members.
NEGATIVE VOTES RESOLVED
YES
NO
Referred back to Director SSB for decision.
STEP 2 FIRST LEVEL APPROVAL
Preparation & distribution of letter ballot to Standing Committee on Standards (MAC)
Letter ballots returned by Committee members
All negative votes resolved
CONSENSUS
SECOND LEVEL APPROVAL ACHIEVED
PROPOSAL NOW RECOGNIZED AS CGSB STANDARD
STEP 3 SECOND LEVEL
Final Review by Stds. Officer Program Mgr., Director (SSB) and CGSB Secretary.
APPROVAL BY STANDARDS COUNCIL OF CANADA AS A NATIONAL STANDARD
STEP 4 FINAL APPROVAL
TRANSLATION, PRINTING, DISTRIBUTION, SALE
STEP 5 PUBLIC AVAILABILITY

3.0 APPROVAL OF THE PAINT-ON-DRYWALL PERMEANCE TEST METHOD

3.1 Preliminary Review and Investigation

In Section 2.3.1, it was noted that an application could be in the form of a complete document or simply a definition of need. In this instance, CHBA was equipped with a complete document in its approach to the standards process. The proposed standard method (see Appendix A) had taken approximately 19 months to develop and prepare (developed by Alberta Research Council for Alberta Municipal Affairs). With this full documentation, and with an understanding of the cost recovery operational mode of CGSB, it was possible to eliminate the majority of the review and investigation tasks of Step 1 as shown in Figure 1. CGSB was contacted by the sponsor[1] in August of 1987, and was advised that a paint test method for permeance on a drywall substrate had been developed and the request for standards activity was put forward.

In recognition of the preliminary work already done by the sponsor, CGSB invited the sponsor to attend the next meeting of the applicable Standards Committee, the Paint Test Committee, to present and explain the proposal. A representative of AMA attended the September 1987 meeting of the Paint Test Committee, presented the proposed standard test method to the members of that committee, and explained that CHBA would be assuming the role of the applicant for the approval process.

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[1] Through its Innovative Housing Grants Program (IHGP) Alberta Municipal Affairs provided the funding for CGSB cost recovery work. AMA is therefore referred to as the sponsor.

At that meeting, the committee members agreed unanimously that the proposal warranted development as a standard, and directed that a working group be formed to further develop the proposal. The proposal was officially numbered as C**/CGSB-1.501-M and was named "Method for Permeance of Coated Wallboard".

Subsequent to the September 1987 meeting, a memorandum of understanding was negotiated between CHBA and CGSB. This was, in essence, a contract stating the responsibilities of CGSB in the development of the standard and the approximate cost to the sponsor for carrying out these responsibilities.

3.2 The Working Group and the First Level Letter Ballot

The working group formed as a result of the September 1987 committee meeting consisted of the following members:

- a representative of AMA (the sponsor), later to be replaced by a representative of CHBA, the applicant
- a CGSB Standards Officer
- a Paint Test Committee member with the necessary technical expertise.

The objectives of the working group were:

- to review the test method as prepared by ARC and to arrange it, where required, into the format required for a CGSB test method;
- to perform a statistical analysis on the test method for the purpose of determining its repeatability precision (see Appendix B);
- to prepare the letter ballot for first level review by voting members of the Paint Test Committee.

These objectives were accomplished by early 1988 and culminated with the issuance of the letter ballot (see Appendix C) to voting members of the Paint Test Committee on March 14, 1988.

3.3 First Level Approval

The next meeting of the Paint Test Committee was convened on April 13, 1988. At that meeting, the results of the First Level Letter Ballot were disclosed and summarized as:

- 23 ballots distributed on March 14, 1988
- 18 returned as of the closing date, April 7, 1988
- 13 votes in favour of approval
- five abstentions
- zero negative votes.

As noted in Section 2.2.1, more than three abstentions can require further discussion to discover the underlying reasons for abstention. After some discussion at the meeting, the number of abstentions was in fact reduced to three, with no change to the negative vote status. First Level approval was, therefore, achieved at the April 13, 1988, Paint Test Committee meeting.

During its discussion, the committee noted that some further work respecting repeatability (reliability of the test when carried out by the same laboratory), reproductibility (reliability of the test when carried out by different laboratories), and the effects of variability in the gypsum wallboard substrate could be investigated by the sponsor. These comments, however, were not of sufficient significance to withhold approval of the test method from the committee's collective point of view.

3.4 Second Level Approval

Following approval at the first level, a second letter ballot was prepared for distribution to voting members of the Standing Committee on Standards. A breakdown of the votes cast is not available for this report. However, the SCS, by return ballot, voted in favour of approval of the Method for Permeance of Coated Wallboard. This decision was reached at the July 27, 1988 meeting of the SCS. Having achieved this second level of approval, the Method for Permeance of Coated Wallboard gained official status and recognition as a CGSB Standard.

3.5 Approval as a National Standard

Though not within the scope of this project, the Method for Permeance of Coated Wallboard did receive subsequent approval for elevation to the status of National Standard.

Having been identified during initial review as a proposed standard with a scope of national interest, the document was forwarded to the Standards Council of Canada for final review. During the course of its review, the SCC publishes the name and designation of CGSB standards proposed for elevation to National Standard Status in a monthly publication called Consensus. Comments are solicited from all individuals and organizations who may have an interest or opinion on the proposed National Standard. The Method for Permeance of Coated Wallboard was referenced in the July 1988 edition of Consensus.

The comments that may have been received are not known to the authors of this report. It can, however, be concluded that reaction was not adverse, since the Standards Council of Canada advised on August 10, 1988, that the Method for Permeance of Coated Wallboard had been approved as a National Standard of Canada.

Now numbered and known officially as CAN/CGSB-1.501-M88 "Method for Permeance of Coated Wallboard", the new National Standard is, at the date of this report, in the process of being translated and reproduced for distribution and sale in both official languages.

The standard will be available to the general public at a cost per copy of approximate $30. The anticipated date of publication is April 1989.

3.6 Cost of the Approval Process

Just as the time for completion of the approval process is difficult to predict, so are the total costs difficult to specify. The approximate cost for developing and approving the Permeance Method for Coated Wallboard was $60,000. That amount is represented by the following major cost items:

- Development of the test method - - - $35,000[1]
- CGSB Cost Recovery contributions - - $12,000[2]
- Project administrative costs - - - - $13,000[2]

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[1] Research and development funding provided by Alberta Municipal Affairs, as a directed study through its Innovative Housing Grants Program.

[2] Funding provided by Alberta Municipal Affairs as a grant through its Innovative Housing Grants Program.

The cost of translating, printing and distribution of the standard is borne by CGSB, and these costs are recovered over time through sale of the published standard to industry, government and the general public.

4.0 OBSERVATIONS AND CONCLUSIONS

4.1 Achievement of Objectives

The primary objective of this project was accomplished in the remarkably short period of 12 months. This can be attributed to two major reasons:

- the spirit of co-operation extended by CGSB, and
- the preparedness of the sponsor.

As can be seen from Section 2 of this report, the task of obtaining CGSB approval for a proposed standard can be complex and time-consuming. The CGSB recognizes this, and therefore extends its full co-operation, support and assistance to potential sponsors.

With a prepared document in-hand, the sponsor was able to essentially eliminate the preliminary review and investigative stages of the approvals process. In effect, the approval process for the Method for Permeance of Coated Wallboard began with the assignment of the working group at the September 1987 meeting of the Paint Test Committee.

4.2 Accessibility of the Standards Process

The standards approval process is available to everyone. However, the cost and time implications of developing and obtaining approval for a proposed standard places the approval process out of the practical reach of most individuals and, for that matter, most small businesses.

By definition, a standard represents a topic or subject matter that is relevant to a large segment of an industry. It would follow, then, that once the need for a standard has been identified, it is best pursued on behalf of the particular industry by representative associations. As an applicant representing the home builders of Canada, CHBA found, through this exercise, that industry can indeed benefit from the standards approval process.

4.3 Advisory Committee on Construction Standards

During the course of approval of the Permeance Method, CHBA was invited by CGSB to become a member of the Advisory Committee on Construction Standards (ACCS). The ACCS, consisting of members with considerable expertise in the construction industry, provides recommendations to the Minister's Advisory Council on the need for new standards and on the suitability and applicability of proposed standards affecting the construction industry. Through participation in the Advisory Committee on Construction Standards, CHBA will be able to more effectively monitor and influence materials and methods standards affecting the housing industry and, by keeping CHBA members up to date, can ensure the immediate transfer of relevant information to the house building industry.

4.4 Impact on ADA and the Housing Industry

The Airtight Drywall Approach, through demonstration, has been proven to be a technically and economically viable process, but its implementation by industry has been somewhat hampered by the continuing requirement for a polyethylene vapour diffusion retarder.

With the standardization of the Permeance Method for Coated Wallboard, that obstacle has been removed. Other improvements in the method itself have correspondingly improved the cost effectiveness of ADA, to the point that high levels of airtightness can be achieved at modest cost. Widespread implementation of ADA by the housing industry is now dependent only on the marketing efforts of the industry itself.

4.5 Continuing Work

In Alberta, work is continuing to ensure the adoption of the Permeance Method for Coated Wallboard. Discussions are in progress with the Building Standards Branch of Alberta Labour (the agency responsible for administration and enforcement of the Building Code in Alberta) for the purpose of drafting and issuing of a technical bulletin combining ADA with the Permeance Method. This bulletin, expected to be issued by mid-1989, will define the acceptable conditions of use for the Airtight Drywall Approach, such that approval on a job-by-job basis will no longer be required.

APPENDIX A

PERMEANCE TEST METHOD AS DEVELOPED BY ALBERTA RESEARCH COUNCIL

.0 SCOPE

1.1 This standard covers the performance requirements of commercial paints applied to standard (12.7 mm) gypsum wallboard material for use in controlling water vapour diffusion through horizontal and vertical building assemblies.

1.2 The material involved in this standard is intended for use in above-grade building construction (or below-grade building construction).

2.0 APPLICABLE PUBLICATIONS

2.1 The following publications are applicable to this standard:

2.1.1 Canadian General Standards Board (CGSB)

CAN2-51.33-M80	Vapour Barrier, Sheet, for use in Building Construction

American Society for Testing and Materials (ASTM)

C 755	Standard Practice for Selection of Vapour Retarders for Thermal Insulation
D 823	Producing Films of Uniform Thickness of Paint, Varnish, Lacquer and Related Products on Test Pan
D 1005	Measurement of Dry Film Thickness of Organic Coatings using Micrometers
D 1653	Moisture Vapour Permeability of Organic Coating Films
E 96	Standard Test Methods for Water Vapour Transmission of Materials

2.2 Reference to the above publications is to the latest issues, unless otherwise specified by the authority applying this standard.

.0 TERMINOLOGY

3.1 Vapour Retarder - A material that retards the transmission of water vapour under specified conditions.

3.2 Detail Requirement

When applied to gypsum wallboard in accordance with the manufacturer's instructions and tested with the dry-cup procedure the system shall have a water vapour permeance not exceeding 60 ng/Pa•s•m2.

3.3 Preparation for Delivery

3.3.1 Packing, Packaging and Marking

Normal commercial methods of packing, packaging and marking shall be acceptable.

3.3.2 Labelling

Each container of material shall be identified by a clearly visible label. The label shall identify the contents as vapour retarding material conforming to this standard in a manner similar to the following:

(Trade name)
Paint Vapour Retarder
Complies with CGSB Standard CAN ...

The label shall include the manufacturer's name, address and trademark and shall include the manufacturer's recommended coverage so as to meet this standard.

3.4 Materials

3.4.1 Sampling

Each sample shall consist of a 4L container of paint.

3.4.2 Material

The coating materials shall be applied to standard 12.7 mm (1/2") gypsum board consisting of one coat of primer and two coats of finish unless otherwise specified in the manufacturer's instructions.

3.4.3 Application Method

In order to obtain a uniform film of consistent thickness the material shall be applied in accordance with ASTM D 1005.

3.5 TESTING METHOD

3.5.1 Conditioning

Unless otherwise recommended in the manufacturer's specifications, the painted gypsum board sections shall be conditioned to constant weight (±x%: tolerance depends upon size of specimens) at 23±2° C and 50±5% R.H.

3.5.2 Water Vapour Permeance

3.5.2.1

Determine the water vapour permeance on three specimens in accordance with ASTM E 96 (Desiccant Method).

3.6 USES (NOTES)

3.6.1

Selection of the vapour retarder material for any given situation should depend on the specific environment where the material will function. For further information, refer to ASTM C 755.

3.6.2

The materials described herein are intended primarily for use in conventional dwelling construction in which high wintertime relative-humidity conditions are not anticipated.

3.6.3

To attain a vapour retarder in the building envelope using material to this standard, care should be taken during construction to apply methods that prevent air leakage. The coating is of minor importance compared to sealing openings in the construction.

APPENDIX B

STATISTICAL ANALYSIS OF THE PERMEANCE TEST METHOD AS DEVELOPED BY ALBERTA RESEARCH COUNCIL

Review* by H. E. Ashton of Alberta Municipal Affairs
Report on Development of a Testing Procedure for Paints Used as Vapour Retarders

COMMENTS

Executive Summary (ES)

Introduction para 1 1.1 para 2	The effect of wind or stack pressure on polyethylene vapor barriers is not important in low-rise home construction for the reasons given on p. 56 of the Proceedings of Building Science Insight '84.
ES Approach para 1	Should state that the value is for Type 2 after accelerated aging.
para 2	The fact that a test method does not specifically state that a certain substrate can be used does not mean that it is not applicable (not "representative").
para 3	The term "reproducibility" is not used in accordance with most statistical practices, e.g., ASTM D 3980 and E 180. Reproducibility is one measure of precision and it applies to the degree of agreement to be expected from measurements carried out in different laboratories, not just in one laboratory. The term for the latter is "repeatability", but even that is not really covered in the reported work.
ES Findings para 1 Conclusions para 1 4.9	As noted above, "precise" and "reproducible" cover the same subject, the latter being one category of the former.
ES Findings para 2 5.0 para 2	The values summarized do not reflect all the measurements made on some combinations.
b)	The value of 28 is from Table 15 but values of 18 (Table 4) and 27 (Table 14) were obtained for the same system.

* This does not include comments that were submitted to Walter Cool on the interim report on 1987-03-02, unless they were overlooked in the final version.

e)	The two results of 13 and 14 from Table 4 can be compared to the mean of 20.6 and range of 9 from 10 measurements in Table 8.
g)	This should state that there was one coat of proprietary material and distinguish between the ranges for latex of 33 to 46 and 11 to 26 for alkyd.
para 3	This should have been placed after para 2 b) for ease of comparison.
para 4	The type of average, in this case the mean, should be stated in a technical report.
1.1 para 3	The degradation of polyethylene film is not necessarily caused by oxidation; one important process is depolymerization resulting from exposure to the ultraviolet portion of solar radiation. Addition of carbon black as a UV absorber is an inexpensive way to stop this reaction.
Table 1	The value of 96 in a 1984 reference would be for a flat alkyd as flat oil interior paints have not been used for 30 to 35 years.
2.3	Change "oil based" to "solvent-reducible".
3.2.2 a)	One might expect that magnesium perchlorate, which is included in D 1653, would also have been considered. The potential hazard is not properly described in D 1653 since the danger arises from regenerating the salt after it has been in contact with organic matter, not from the contact per se.
3.2.4, 4.2.2 para 4, Table 3, 4.3.1, etc.	In 3.2.4 the importance of the primer is discussed but after that the term "sealer" is used. In paint terminology these materials are referred to as "primer-sealers" as in the titles of 1-GP-68 and -119.
3.3.1 para 1	Change ASTM D 1005 to D 823 since the former does not cover preparation of test films, as shown by its title in Appendix B.
para 3	The chief advantage of airless spray, no rebound of the air hence less overspray, has

	been overlooked. With air spray the air pressure also has to be adjusted. The substrate has little effect.
3.4.1	This is really Specimen Preparation. Sample preparation entails mixing the coatings (the samples) before preparing the specimens. CGSB 1-GP-71 application methods specify wetting the roller with the coating before weighing so that the roller is immediately ready to apply the material, which reduces solvent loss from evaporation.
3.4.2.	Again, the correct term is Specimen.
4.1 c)	As noted, this is part of repeatability.
4.2.2 para 1} Table 3 }	Delete "sample(s)" after "control(s)" as in last sentence of para .
4.2.2 para 4	The most important observations - that there was no significant difference between the two methods of calculation but that the range between triplicates decreased markedly with additional coats of paint - have been overlooked.
Table 3	According to 4.2.2 the only difference between the controls and the test specimens was absence of desiccant. Hence, all had gypsum wallboard so the second column is an unnecessary complication. Judging by para 4 of 4.2.2 the same latex paint was used for both coats but the position of the asterisk in the heading makes this questionable. If it is true delete the asterisk and its footnote and place "Low--Luster" before "Latex Paint" in the legend for EP as 8 footnotes to a table are more than sufficient.
Table 4	Since Table 3 was discussed separately, it would have been preferable if the results presented here had been similarly treated instead of attempting to summarize without regard for the number of coats.
4.3.2 para 2	Seeing that the vapor barrier paint used was a latex paint it cannot be said to be superior to itself; "usual type of" should be added before "latex coatings".

Table 5	The percent coverages of the topcoat for the last two specimens are in the wrong column; they should appear under 1AE as with specimens 47 and 48.
4.4	Heading should be Precision which can include reporting the range, the mean deviation and/or the standard deviation. As noted before, reproducibility cannot be obtained from one laboratory and true repeatability requires repeating sets of three (E 96) or four (proposed method) at different times. The term "replicates" is used in the report but, in view of other misuse of statistical terms, it is not definitely known when the ten results appearing in each of Tables 7, 8, 13, 14 and 15 were obtained. Consequently they were treated as one set in the analysis reported below but the result is not really repeatability. It should be noted that the standard deviation appearing below each table is not a +/- value but an absolute value similar to the mean deviation.(The latter is the arithmetic mean of the deviations while the standard deviation is the square root of the arithmetic mean of the squared deviations or variances.)
4.4.1	The last sentence is really just part of determining the precision - the poorer the repeatability the more replicates are required.
4.4.2 para 1	The confidence limit (the range within which the mean is found in a given percent of cases) is not usually of interest to users of precision statements. What operators or analysts want to know is the maximum acceptable difference between a certain number of results from the same laboratory or a given number of laboratories.
para 2 and 3	In cases where the degree of agreement, whether expressed as the range or the standard deviation, becomes poorer (larger numbers) at higher values, it is usual to try to eliminate this effect by dividing by the mean. The standard deviation calculated as a percent of the mean is called the coefficient of variation: $v,\% = s/X \times 100$. In this study the use of this coefficient reduces the

	variability between sets caused by differences in their means.
para 4	The validity of this statement is questionable, as shown by the results in Tables 10 and 11. It is very difficult to discard an extreme result when there are only three. Even the result from specimen 91 in Table 11 cannot be discarded at a significance level of 0.05%.
Table 9	The result from specimen 85 should be discarded as it is an outlier.
4.6.2	This does not explain why there is no difference between the means of Tables 13 and 15 where in the latter the coverage of the sealer is about 69% and of the enamel 59% of those in Table 14.
4.7.2	The comparison should not be with Table 9 (reverse vapor flow) but with Table 8 for the alkyd sealer/enamel combination (see 4.8.2). There is no valid comparison for the sealer alone.
4.9 para 3	The maximum of 60 is for accelerated aged specimens; for unexposed films the limit is 45.
Appendix A 3.4.3	ASTM D 1005 does not cover application of films.
Appendix B D 823	The films are produced on Test Panels, not Pans.

_STATISTICAL ANALYSIS

An analysis of variance of the first four systems in Table 4 - 1 or 2 coats of alkyd primer-sealer and 1 or 2 coats of alkyd velvet enamel - shows that although the values appear fairly similar the difference between 1 and 2 coats of sealer and of topcoat are statistically significant at confidence levels of 97.5 and 99.9% respectively. Consequently, the systems in order of increasing permeance are : 2 coats of each, 1 coat sealer and 2 coats enamel, 2 coats sealer 1 coat enamel, and 1 coat of each. The reason for these permeance values being so low is the very high application rate of the first coat of sealer.

Because of the very high permeance of the latex systems there is no point in analyzing the results. It is, however, possible to examine the question of alkyd finish over latex primer-sealer vs the opposite system. Because of the greater range between duplicates, the confidence level for significance of the number of topcoats is reduced to 98.5% while the system order is significant at 97.5%. Consequently, the sequence of increasing permeability is 1 coat of alkyd sealer and 2 coats of latex paint, 1 coat latex sealer and 2 coats alkyd enamel, 1 coat alkyd sealer 1 coat latex paint, and 1 coat latex sealer 1 coat alkyd enamel. It is evident that the solvent-borne sealer is preferable to the water-borne one. It is also obvious that systems that include one latex coating have a significantly higher permeance than the corresponding all solvent-borne systems; e.g., specimens 21 and 22 vs 29 and 30 or 37 and 38. This agrees with the conclusion appearing in para 2 of 4.3.2. It should be noted that the last pair does not comply with the requirement of 45 for vapor barrier films that have not been subjected to accelerated aging.

The results in Table 5 have to be analyzed statistically in subsets because some are anomalous and lead to significant interactions between the main factors when all sixteen are considered together. The problem arises from the markedly higher permeance from two coats of alkyd enamel applied over two coats of vapor barrier paint than over one coat and a slightly higher permeance for one coat of alkyd enamel applied over two coats of barrier paint vs one coat. In the subset analyses the only systems that differ significantly are two coats of vapor barrier paint are better than one under one or two coats of latex paint (95% confidence level) and alkyd enamel is a better topcoat than latex paint over one coat of vapor barrier paint (99% level). Increasing the number of latex topcoats has no effect whether applied over one or two coats of the barrier paint.

The same alkyd-vapor barrier results confound comparison with the corresponding alkyd primer-sealer systems in Table 4. In this case the analysis does confirm that the effect of the number of prime coats depends upon the composition, improving with alkyd coats but decreasing with the vapor barrier paint. Two coats of alkyd enamel over either priming material are more impermeable than single coats (97.5% confidence level) and in three out of four subsets the alkyd sealer provides lower permeance than the vapor barrier paint. A greater number of specimens would be needed to establish whether some of the trends not shown to be significant really are or that some or all materials yield a wide range in permeance values when used over vapor barrier paint.

Precision of Method

In calculating the precision of a test method each set of results should first be examined for wild (extreme) values. The easiest way is Dixon's test in which a suspect result is compared to its nearest neighbor and to the complete range or one less than the range if the number of values is greater than 7; see Table 3 and the relevant sections in ASTM Practice D 3980. The control chart (mean and range) technique covered in D3 of Practice E 180 can also be used.

In the statistical analysis, it was possible to discard only the divergent value in Table 9. Even the results from specimens 91 and 134 could not be rejected on the basis of Dixon's test because of the low number of replicates for the first case and the inherent variability of the water vapor transmission method for the second. The Summary of the analysis to determine the precision of the method is given in the attaached table. The final values allow users of the method to establish the range that should not be exceeded when sets of three or four measurements are made at the same time. Extreme values can thus be rejected on the basis of a large number of tests. Unfortunately, it does not provide the maximum ranges for the means of two sets measured at different times in the same laboratory or in different laboratories.

Table No.	Coating System	n	Total	Mean	Net Total Sum Sq	DF	s_w^2	s_w	v_w,%	MAD System	MAD Pooled	Range
7	1 Latex PS, 2 Latex Pt	10	2823	282.3	1208.1	9	134.23	11.59	4.105	66.5	206	37
8	1 Alkyd PS, 2 Alkyd Vel.	10	206	20.6	72.4	9	8.044	2.84	13.77	16.3	15.0	9
9	1 Alkyd PS, 1 Alkyd Vel*	4*	157	39.25	78.75	3	26.25	5.12	13.055	35.0	23.0	12
13	1 Alkyd Primer-Sealer	10	325	32.5	168.5	9	18.72	4.33	13.314	24.84	23.7	15
14	1 Alkyd PS, 1 Alkyd Vel.	10	270	27.0	318	9	35.33	5.945	22.016	34.1	19.7	18
15	1 Alkyd PS, 1 Alkyd Vel.	10	281	28.1	280.9	9	31.21	5.59	19.88	32.1	20.5	15
16	1 Alkyd PS, 1 Alkyd Gl.	5	169	33.8	26.8	4	6.7	2.59	7.658	16.33	21.0	5
17	1 Alkyd PS 1 Alkyd Sgl.	5	192	38.4	231.2	4	57.8	7.60	19.8	48.0	23.9	20

* Reverse vapor flow; one extreme result discarded.

Pooled Coefficient of Variation:

$$v_{wp} = \left\{ \frac{9(4.105^2 + 13.77^2 + 13.314^2 + 22.016^2 + 19.88^2) + 4(7.658^2 + 19.8^2) + (3 \times 13.055^2)}{(9 \times 5) + (4 \times 2) + 3} \right\}^{1/2}$$

$$= \left\{ \frac{13686.456}{56} \right\}^{1/2} = 244.401^{1/2} = 15.633 \sim 15.63\%$$

n	3	4	5	10
$q_{5}6$	3.40	3.74	3.98	4.67
MAD (v_{wp} x q)	53.2	58.5	62.2	73.0

National Research Council Canada
Conseil national de recherches Canada

Institute for Research in Construction
Institut de recherche en construction

Ottawa, Ontario
K1A 0R6

JUL 13 1988

File Référence 1988-06-07

Mr. Ross Monsour
Canadian Home Builders Association
Suite 702, 200 Elgin Street
Ottawa, Ontario
K2P 1L5

Dear Ross:

At the spring meeting of the CGSB Paint Test Methods Committee the results of the ballot on the test method for the permeance of coated wallboard were discussed. Although the method was approved for advancement to the next step required for issuing it as a National Standard, it was decided to raise two points with the sponsor of the method.

As mentioned at the meeting and in my review of the Alberta Municipal Affairs Report on developing a test procedure, true repeatability - the range between the means of sets of triplicates or quadruplicates obtained at different times - and reproducibility - means of sets from different laboratories - were not determined in the Alberta Research Council studies. Consequently, the precision statement in the current version of the method is quite limited in scope and usefulness.

The question of possible variability in the permeance of gypsum wallboard was raised. Some members were of the opinion that as long as wallboard complies with ASTM Specification C 36 there should be no problem but others felt that because transmission of water vapor is not controlled in C 36 the results of the test might be affected by the substrate.

The committee believes, therefore, that CHBA should decide whether the further work mentioned in subsection i) of Phase I c) of its proposal to CGSB needs to be undertaken. The improvement to the precision statement could be carried out under the supervision of the Paint Test Methods Committee. The study on the difference in permeability of wallboard obtained from several suppliers should be made by a laboratory familiar with both the substrate and permeability measurements, such as the Alberta Research Council, ORF, or the Institute for Research in Construction of NRC.

My apologies that preparations for attendance at meetings of ISO and ASTM have delayed this letter.

Yours sincerely,

HEA:dgc

H.E. Ashton
Chairman, CGSB Paint Test
Method Subcommittee

cc. R. Khan, Secretary, CGSB Paint Test Method Subcommittee

APPENDIX C

LETTER BALLOT AND DRAFT STANDARD FOR FIRST LEVEL APPROVAL

Canadian General Standards Board
Office des normes générales du Canada

CGSB
ONGC

14 March 1988 ACG 6481-1/GP/6

PAINT TEST METHODS

To Members of the Committee:

Please find enclosed for your consideration and approval a committee letter ballot (C1-130) for new test method C**/CGSB-1.501-M, Method for Permeance of Coated Wall Board.

The decision to develop a new method was taken by the committee at our last meeting after reviewing the request of the Alberta Municipal Affairs Department for the preparation of a test method for determining the water vapour permeability of organic coatings when applied to gypsum wallboard. This first draft was prepared by Mr. H. Ashton.

Please complete and return one copy of the ballot by the closing date.

Yours sincerley,

Rafeek A. Khan
Committee Secretary
(819) 956-0421
(819) 956-4716 (Fax)

Encl.

Mailing Address/Adresse Postale
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Hull

Canada

1/GP/6

PAINT TEST METHODS

(Voting Membership as of01 OCT 87)

Chairperson

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Program Manager CGSB

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1/GP/6

PAINT TEST METHODS

(Information Membership as of 01 OCT 87)

1	MR. G.J. DALTON	U	DEPARTMENT OF NATIONAL DEFENCE
2	MR. M. LEGAULT	P	CANADIAN GENERAL STANDARDS BOARD
3	MR. R.W. MURRY	P	CANADIAN PAINT AND COATINGS
4	MR. WAYNE NESRALLAH	O	CANADIAN GENERAL STANDARDS BOARD

COMMITTEE BALLOT **BULLETIN DE VO**
DU COMITÉ

Ballot No. — N° du bulletin	Closing Date — Date limite	File No. — N° du dossier
C1-130	7 April 1988	ACG 6481-1/GP/6

TO — À:

Committee — Le comité concerné

PAINT TEST METHODS

RETURN OF A BALLOT IS A NECESSARY PREREQUISITE TO STANDARDS DEVELOPMENT

The publications listed below are submitted for your approval. Please complete this ballot and return one copy not later than the above closing date. If your vote is negative, you must provide your reasons.

LE RENVOI DU BULLETIN DE VOTE EST UNE CONDITION PRÉALABLE NÉCESSAIRE À L'ÉLABORATION DES NORMES

Les publications énumérées ci-dessous vous sont soumises pour approbation. Veuill remplir le présent bulletin et en retourner la partie supérieure au plus tard le jour c l'échéance. Si vous répondez par un non, vous devez en donner les raisons.

CGSB Standards Officer's Remarks — Remarques de l'agent des normes de l'ONGC

Please refer to the attached letter by the Standards Officer.

The return of a ballot is a necessary prerequisite to standards development. Please return one copy by the closing date.

Rafeek A. Khan
Standards Officer — Agent des normes

(819) 956-0421
Tel. — Tél.

14 March 1988
Date

Publication	Title — Titre	Yes Oui	No Non	Abstentio
C**/CGSB-1.501-M	Method for Permeance of Coated Wallboard	......	......	....

Please check ☐ one box only to indicate your interest
Cochez ☐ une case seulement pour indiquer votre intérêt

☐ Producer / Producteur
☐ User / Usager
☐ General interest / Intérêt général

Signature

Name — Please Print — Nom en lettres moulées

Representing — Représentant

Date

Return top copy to:
R.A. Khan
Canadian General
Standards Board
Ottawa, Canada
K1A 1G6

Prière de retourner
la partie supérieure à:
L'Office des normes
générales du Canada
Ottawa, Canada
K1A 1G6

First Draft
March 1988

C**/CGSB-1.5

Method for Permeance of Coated Wallboard

1. Scope

1.1 This method is for use in determining the water vapor permeance of organic coatings when applied to gypsum wall board.

> Note 1 - The coated wallboard is intended for use in the type of construction where the coating retards water vapor transmission and the wallboard, together with appropriate gaskets, provide the air barrier to prevent leakage of humidified air.

2. Applicable Publications

2.1 The following publications are applicable to this method:

2.1.1 Canadian General Standards Board (CGSB)

CAN/CGSB-1.71 - Methods of Testing Paints and Pigments
No. 2.1 - Density (Mass per Unit Volume)
99.1 - Preparation of Plain Aluminum Panels
100.1 - Preparation of Plain Steel Panels
103.1 - Conditions for Air Drying Coatings
134.3 - Brush and Roller Application of Enamels on Primed Steel
134.7 - Brush and Roller Application of Paints and Enamels on Sealed Boards

2.1.2 ASTM

C 36 - Specification for Gypsum Wallboard
D 823 - Methods for Producing Films of Uniform Thickness of Paint, Varnish and Related Products on Test Panels
D 1005 - Methods for Measurement of Dry-film Thickness of Organic Coatings Using Micrometers
D 1186 - Methods for Nondestructive Measurement of Dry-film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base
D 1212 - Methods for Measurement of Wet-film Thickness of Organic Coatings
D 1400 - Method for Nondestructive Measurement of Dry-film Thickness of Nonconductive Coatings Applied to a Nonferrous Base
D 1653 - Method for Water Vapor Permeability of Organic Coating Films
D 3980 - Practice for Interlaboratory Testing of Paint and Related Materials
D 4414 - Practice for Measurement of Wet-film Thickness by Notch Gages
E 96 - Methods for Water Vapor Transmission of Materials

3. Apparatus and Materials

3.1 Coatings. Unless the material is self-priming, one litre of primer and 2 L of finish.

3.2 Gypsum wallboard 13 mm thick complying with ASTM Specification C 36.

3.3 Equipment for applying the coating system uniformly to gypsum wallboard test panels.

3.4 Means for determining the quantity of coating applied.

Note 2 - This varies with the manufacturer's method of specifying application rate and method of application.

3.5 Apparatus for measuring the water vapor permeance of the coated wallboard panels in accordance with ASTM Method D 1653 or E 96, unless otherwise agreed or specified.

4. Test Panel Preparation

4.1 Application by Roller. Use a 190- or 250-mm roller complying with the description given in Methods 134.3 and 134.7. Cut the 13-mm wallboard into 0.6 by 1.2-m rectangles and condition (Method 103.1) them for at least 48 h.

4.1.1 Weighing Procedure when coverage is in m^2/L.

4.1.1.1 If not known, determine the density (Method 2.1) and calculate to 0.5 g the amount to be applied to meet the required spreading rate, using the equation:

$$\text{Mass, g} = 1000\ D\ A / SR$$

where D = density, g/mL
A = area of panel (0.72 m^2)
SR = spreading rate, m^2/L.

4.1.1.2 Before applying the well-mixed primer, or the finish if it is self-priming, wet out the roller on a smooth surface with the material to be applied. Then weigh the wetted roller and the tray containing the material.

4.1.1.3 Apply the coating with back and forth strokes of the roller parallel to one dimension and then cross-rolling at 90° to the first direction. Continue applying material in this manner until the required quantity has been applied as determined by weighing the roller and the tray with the remaining liquid coating. Carry out this application carefully but as rapidly as possible to minimize loss of volatiles from the coating. Allow the applied coating to dry (Method 103.1) in a horizontal position for the specified or agreed time.

4.1.1.4 If the manufacturer specifies a second coat or one or two coats of a different material repeat the application as described in 4.1.1.1 to .3 until the system is complete.

4.1.2 Wet- or Dry-film Procedure when application rate is described by film thickness.

4.1.2.1 For wet-film thickness apply the material as described in 4.1.1.2 and .3 and measure the applied thickness in accordance with Method A of ASTM D 1212. If desired, the amount being applied can be monitored using notch gauges as described in ASTM Practice D 4414 but the final readings should be by D 1212. Repeat for additional coat or coats.

4.1.2.2 For dry-film thickness, allow the complete system to dry and follow Method A of ASTM D 1005 to obtain its thickness but avoid areas within 30 mm of the edges and do not remove film from four areas equivalent to 250 by 250 mm (par. 4.1.3) Another approach is to convert the wet-film thickness determined in 4.1.2.1 to dry film by using the equation:

$$DT = WT \times NV$$

where DT and WT are dry- and wet-film thickness and NV is volume nonvolatile as a decimal fraction.

2

If the dry thickness is lower than required more material has to be applied but if it is too high new panels must be prepared.

4.1.3 After drying for 48 h cut the 0.6 by 1.2-m sections into 275 by 275 mm squares or equivalent rectangles, provided the smaller dimension is not less than 175 mm, and condition them (Method 103.1) for at least 24 h.

4.2 Application by Spray.

4.2.1 This application method is most appropiate for dry-film thickness requirements. Direct measurement of wet-film thickness of coatings applied by air spray is not usually meaningful for those intended primarily for brush or roller application.This is because, to avoid sagging or running of the wet film, fast evaporating solvents are used to reduce the material to spraying viscosity and the amount of additional solvent in the film at the time of measurement is unknown. Determination of wet-film thickness is more suitable for airless spraying of coatings designed for this application without thinning. In both cases, however, it is more accurate to measure the dry-film thickness (4.2.3) and calculate the wet-film thickness using the reverse of the equation in 4.1.2.1; i.e., WT = DT/NT. Similarly, spreading rate requirements must be converted to wet-film and then to dry-film thickness.

4.2.2 Cut the 13-mm wallboard panels into 275 by 275-mm squares or equivalent rectangles (see 4.1.3) and condition them for at least 24 h.

4.2.3 Apply the well-mixed coating(s) in the order specified by the manufacturer, following the instructions given in Method D of ASTM D 823-88, except place clean metal panels (Method 99.1 or 100.1) on either side of single wallboard panels or between and to the outside of multiple panels. Keep each set of sprayed metal and wallboard panels together and in the correct sequence to ensure proper assignment of thickness.

4.2.4 If the thickness of each coat is to be determined separately, place both types of panel in a horizontal position for the recommended drying time. Determine the dry-film thickness on the metal panels in accordance with ASTM D 1186 or D 1400, as appropiate, preferably using the type of instrument shown to have the best precision. If only the total system thickness is to be measured, apply the successive coat or coats, with recommended drying intervals between them, and allow the complete system to dry for 48 h before measuring the film thickness on the metal panels and record as the probable film thickness on the wallboard panels. The last sentence of 4.1.2.2 applies.

4.3 Condition (Method 103.1) the coated gypsum board panels (4.1.3 or 4.2.4) until the mass of each is constant within 50 mg.

5. Procedure

5.1 For each coating system under test, prepare four dry-cup assemblies, each with a test surface 250 by 250 mm,or equivalent dimensions, providing the smaller dimension is not less than 150 mm. Follow ASTM E 96 except that magnesium perchlorate may be used as an alternative to calcium chloride, as in D 1653. In view of the intended use the coated side must face out (see 9.1 of E 96).

> Note 3 - Because the coated wallboard is intended to meet the requirements for a Type 2 Vapor Barrier, the amount of moisture transmitted is relatively low. Consequently, a large surface area is needed to get a measurable quantity in a reasonable time.

5.2 Determine the moisture transmittance of the coated wallboard at 23 ± 0.6°C and 50 ± 2% RH in accordance with Section 11 of E 96. Weigh each assembly to 10 mg at intervals of 24 h ± 15 m.

6. Calculations

6.1 Calculate the permeance in SI units by the equation:

$$P \text{ in } \overset{ng}{\cancel{mg}}/Pa.s.m^2 = WVT \overset{S}{\underset{\wedge}{\div}} (R_1 - R_2) \qquad P \text{ in } ng/Pa.s.m^2 = WVT \div S(R_1 - R_2$$

where WVT = water vapor transmission rate, g/h.m^2,
S = saturation vapor pressure at test temperature, mm Hg,
R_1 = percent relative humidity in conditioned room or chamber, and
R_2 = 0% relative humidity in cup

6.2 Calculate the mean and range for the four specimen of each coating system. Calculate the range as the percent of the mean.

7. Precision

7.1 The permeance of coated wallboard was measured in one laboratory using up to three operators to apply the following systems: alkyd primer-sealer, latex primer-sealer and paint, alkyd primer-sealer and low-luster (velvet) enamel (3 sets), alkyd primer-sealer and semigloss enamel, and alkyd primer-sealer and gloss enamel. The mean, range, standard deviation, coefficient of variation and degrees of freedom for each set, after discarding one result from one set using Dixon's test*, are presented in the table. Based on the pooled coefficient of variation the following criteria should be used for judging, at the 95% confidence level, the acceptability of results:

Repeatability - Three results from the same laboratory should be considered suspect if they differ by more than 53% relative. For four results the maximum acceptable difference is 58.4% relative.

7.2 Reproducibility - An interlaboratory study has not been carried out so no information is available. Normally reproducibility is poorer than repeatability although at high levels of permeance and at least four measurements by each laboratory it is possible for the two values to be similar.

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* Table of ASTM Practice D 3980

TABLE

Coating System	Permeance, ng/C*		Degrees of Freedom	Standard Deviation	Coefficient of Variation, %	MAD ng/C
	Mean	Range				
Latex Primer/Paint	282.3	37	9	11.59	4.1	66.5
Alkyd Primer/Velvet	20.6	9	9	2.84	13.8	16.3
Alkyd Primer/Velvet	39.25	12**	3	5.12	13.05	35.0
Alkyd Primer	32.5	15	9	4.33	13.3	24.8
Alkyd Primer/Velvet	27.0	18	9	5.94	22.0	34.1
Alkyd Primer/Velvet	28.1	15	9	5.59	19.9	32.1
Alkyd Primer/Semigloss	38.4	20	4	7.60	19.8	48.0
Alkyd Primer/Gloss	33.8	5	4	2.59	7.66	16.3

All sets meet their individual maximum range values.

* C = Pa.s.m^2
** Range of 42 before discarding wild result

Because of the large difference in means and the relatively large difference in standard deviations it was decided to pool the coefficients of variation to cover the entire permeance range.

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APPENDIX D

CGSB APPROVAL LETTERS

Canadian General Standards Board
Office des normes générales du Canada

CGSB
ONGC

4 August 1988

Mr. T.J. Toth
Research Project Manager
Alberta Municipal Affairs
Housing Division
Research and Development Section
2nd Floor
9925 - 107 Street
Edmonton, Alberta
T5K 2H9

Dear Mr. Toth:

Further to your letter of 8 June 1988 and our telephone conversations of 14 July 1988 and 3 August 1988, I am providing you with an update on CAN/CGSB-1.501-M, Method for Permeance of Coated Wall Board.

This test method was recently given second level approval (27 July 1988) by the CGSB Minister's Advisory Council (MAC). It was then submitted to the Standards Council of Canada (SCC) on 4 August 1988 for approval as a National Standard of Canada with a request for it to be considered as a priority item.

The test method is currently being translated by the Secretary of State Department and it is expected that it should be published by the end of this fiscal year.

If you need any additional information please do not hesitate to contact me.

Yours sincerely,

Rafeek A. Khan
Program Manager
Standards and Specifications Branch.
(819) 956-0421

FAX: (819) 956-4716

c.c. R. Charest

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Canadian General Standards Board
Office des normes générales du Canada

CGSB
ONGC

24 August 1988

Mr. T.J. Toth
Research Project Manager
Alberta Municipal Affairs
Housing Division
Research & Development Section
2nd Floor
9925-107 Street
Edmonton, Alberta
T5K 2H9

Dear Mr. Toth:

Reference is made to my letter dated 4 August 1988, regarding the status of CAN/CGSB-1.501-M88, Method for Permeance of Coated Wallboard.

I am please to advise you that the above noted standard was approved as a National Standard of Canada by the Standards Council of Canada (SCC).

Please find enclosed a copy of the SCC's letter of approval and a copy of the approved draft.

If you need any additional information please do not hesitate to contact me.

Yours sincerely,

Rafeek A. Khan
Program Manager
Standards and Specifications Branch
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Encl.

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STANDARDS COUNCIL OF CANADA
CONSEIL CANADIEN DES NORMES

1988-08-10

SCC CAN/CGSB-1.501 1266

Mrs. Janet Randall
Acting Director
Standards and Specifications Branch
Canadian General Standards Board
OTTAWA, Ontario
K1A 1G6

Dear Mrs. Randall:

Subject: National Standard of Canada

CAN/CGSB-1.501-M88
Method for Permeance of
Coated Wallboard

Reference is made to your letter dated 2 August 1988, regarding the recognition of a CGSB standard as a National Standard of Canada.

I am pleased to advise you that the above-noted standard is approved as a National Standard of Canada, subject to the inclusion of the responsibility of the user note, as described in Criterion 3 of CAN-P-2D.

Since the standard has been submitted in draft form, it is understood that an appropriate foreword and translation acknowledgement note will be included.

One copy of this National Standard of Canada would be appreciated for our records when published.

The standard will be listed in both language versions of CONSENSUS as soon as possible.

Yours sincerely,

Jack Perrow.

Dr. J. Perrow
Director, Standardization Branch

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RECD./REÇU
AUG 15 1988
CGSB-ONGC

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